A PROGRAM TO IMPROVE THE SAMPLE DISTRIBUTION PROGRAM OF THE NININGER METEORITE COLLECTION

Semiannual Status Report

for the Period September 1, 1964, to February 28, 1965

Grant NsG-399

From

National Aeronautics and Space Administration

To

Arizona State University

By

Carleton B. Moore, Principal Investigator

April 1, 1965

INTRODUCTION

This is a status report of the research activities carried out during the fourth six months of Grant NsG-399 from the National Aeronautics and Space Administration to Arizona State University. This grant supports a program to improve the sample distribution program of the Nininger Meteorite Collection. This grant has been extended for a period of three years under Grant NsG-399, Supplement No. 1, to continue to characterize and describe meteorites in the collections of Arizona State University. During this period eight new meteorite falls were acquired and partially or completely classified. Information on these meteorites has been forwarded to E. L. Krinov for inclusion in "The Meteoritical Bulletin" published by the Permanent Commission on Meteorites of the International Geological Congress. Investigations of the gallium and germanium contents of iron meteorites were continued and a method for the determination of carbon in meteorites developed. Petrographic analysis of selected meteorites particularly with respect to their opaque mineralogy was continued.

During this six month period, 83 specimens were sent to 26 investigators.

The research staff supported by the grant during this period was:

Charles F. Lewis, B. S., Assistant Curator

The salary of the principal investigator is paid entirely by Arizona State University.

METEORITE CHARACTERIZATION PROGRAM

The following meteorites have been partially investigated and classified:

Atwood, Colorado (H4.4)

A fine grained highly metamorphosed compact chondrite Badly weathered. Total iron 22.0%, metallic iron 4.5%, sulfur 2.40%. Classified as an olivine bronzite chondrite but may be an amphoterite.

Brownfield #2, Texas (H16.2)

Moderate number of chondrules ranging from radial pyroxene to olivine. Porphyritic olivine chondrules striking. Total iron 27.0%, metallic iron 8.8%, sulfur 1.94%. Classified as an olivine bronzite chondrite.

Fremont Butte, Colorado (H5.2)

Brecciated meteorite with small number of good chondrules. Most chondrules are pyroxene without sharp boundaries. Total iron 20.6%, metallic iron 2.25%, sulfur 2.22%. Classified as an olivine-hypersthene chondrite.

Seminole, Texas (H13.9)

Brecciated chondrite with a moderate number of chondrules without sharp boundaries. Total iron 25.8%, metallic iron 11.0%, sulfur 1.92%. Classified as an olivine-bronzite chondrite.

Santiago Papasquiero, Mexico (721)

Hexahedrite with no unusual structures. Graphite inclusions. Iron 91.26%, nickel 7.51%, cobalt 0.45%.

Bloody Basin, Arizona (723)

Coarse octahedrite. Described in paper to be submitted to "Journal of the Arizona Academy of Science."

Fair Oaks, Arizona (722)

Coarse octahedrite.

The opaque phases of several meteorites have been studied. Following each meteorite is a list of phases observed (in decreasing order of abundance) and textures of particular interest.

Atlanta - enstatite chondrite

Kamacite (with minor taenite), troilite, daubreelite, graphite, pentlandite, alabandite, three unidentified minerals. Samples contain considerable "limonite" produced by terrestrialization. Although there is some evidence of shocking, the main features of interest are connected with the highly reduced state of the meteorite. Graphite and daubreelite are present in place of the chromite that is ubiquitous in most chromites. Lamellae of both daubreelite and alabondite occur within troilite appearing very similar to exsolved phases found in terrestrial sulfide ores.

Beenham - olivine hypersthene chondrite

Kamacite and taenite, troilite, chromite, schreibersite and cohenite, unidentified mineral. "Limonite" from terrestrial oxidation is present. Numerous small metal globules in the silicate matrix and irregular veins of kamacite cutting kamacite - taenite intergrowths suggest remobilization of kamacite after initial exsolution occurred. Plessite is most abundant where metal has been partially replaced by troilite. Kamacite in plessite intergrowths has been selectively replaced by troilite.

Farmington - olivine hypersthene chondrite

Kamacite and taenite, troilite, chromite, ilmenite, rutile, Both metal and troilite grains are fragmented. Kamacite has been partially replaced by troilite prior to fragmentation. Discrete troilite grains show the same crystallographic orientation.

The development of methods for the chemical analysis of iron meteorites for their major constituents and their gallium - germanium

groups has been continued. Insufficient data has been gathered to allow any statistical relationships to be made.

At the September 5, 1962, meeting on Analytical Methods for Meteorites, Dr. H. J. Axon pointed out the scarcity of data on the carbon contents of meteorites. This data should be included in any useful meteorite analysis. We have developed a method for doing this determination. The meteorite samples are burned in an oxygen atmosphere, and the CO_2 produced is determined by a modified Orsat technique. The first results have been submitted to "Science" as a paper on "Carbon Abundances in Chondritic Meteorites." Preprints of this paper have been sent to NASA.

Four slices have been taken from the large Bondoc meteorite. They have been polished and photographed.

METEORITE SAMPLING INVESTIGATIONS

No further data on the Leedey olivine-hypersthene chondrite has been received. Samples were sent to two analysts who have not finished their investigation of the stone.

The mechanical mineralogical analysis of 25 plains and 25 rim specimens of the Canyon Diablo meteorite has been completed. We are now in the process of completing the chemical analysis and statistically

analyzing the data. The mean composition of the two groups is:

	Plains	Rim
Kamacite	87.4	86.7
Taenite-Plessite	1.5	2.9
Cohenite	5.2	8.3
Schreibersite	0.8	0.9
Troilite	1.6	0.7
Graphite	0.9	0.0
Oxide	2.6	0.4

PLANS FOR COMING SIX MONTHS

Primary consideration in the coming months will be given to the publication of moderate amounts of information on meteorites obtained over the past two years.

The gallium - germanium group study in iron meteorites will be continued.

The analyses of carbon in meteorites will be continued.

The analysis and characterization of poorly characterized samples will be continued.

A program to do modal analyses of large slices as outlined in the grant renewal proposal will be initiated.